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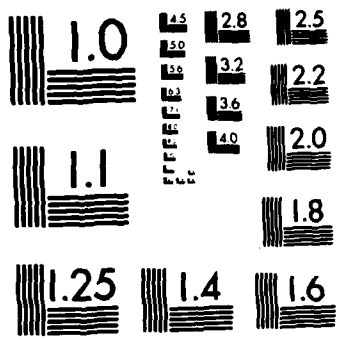

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TECHNICAL REPORT EL-86-40

ROOT PLOWS

Section 8.2.2, US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL

by

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

An equipment report on root plows is provided as Section 8.2.2 of the US Army Corps of Engineers Wildlife Resources Management Manual. The report is designed to assist the Corps District or project biologist with the selection and use of types of equipment and materials available for habitat development and manipulation. Topics covered include description, operation, maintenance, limitations, and availability.

Root plows are pieces of equipment used to control dense stands of root-sprouting woody plants that are not easily controlled by other mechanical means or herbicides. Management objectives for using root plows for habitat manipulation are stated, and effects on wildlife habitat are discussed. The design and assembly of equipment are described and illustrated, and general specifications are provided. Methods of operation are described, and maintenance and safety requirements are given. Appropriate cautions and limitations are discussed.

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PREFACE

This work was sponsored by the Office, Chief of Engineers (OCE), US Army, as part of the Environmental Impact Research Program (EIRP), Work Unit 31631, entitled Management of Corps Lands for Wildlife Resource Improvement. The Technical Monitors for the study were Dr. John Bushman and Mr. Earl Eiker, OCE, and Mr. Dave Mathis, Water Resources Support Center.

This report was prepared by Mr. Ted B. Doerr, Range Science Department, Colorado State University, Fort Collins, Colo. Mr. Doerr was employed by the Environmental Laboratory (EL), US Army Engineer Waterways Experiment Station (WES), under an Intergovernmental Personnel Act contract with Colorado State University during the period this report was prepared. Mr. Chester O. Martin, Team Leader, Wildlife Resources Team, Wetlands and Terrestrial Habitat Group (WTHG), EL, was principal investigator for the work unit. Mr. Harold T. Wiedemann, Texas Agricultural Experiment Station, The Texas A&M University System, Vernon, Tex., provided equipment specifications and photographs used in the report. Review and comments were provided by Mr. Martin, WES, and Mr. Larry E. Marcy, Texas A&M University.

The report was prepared under the general supervision of Dr. Hanley K. Smith, Chief, WTHG, EL; Dr. Conrad J. Kirby, Chief, Environmental Resources Division, EL; and Dr. John Harrison, Chief, EL. Dr. Roger T. Saucier, WES, was Program Manager, EIRP. The report was edited by Ms. Jessica S. Ruff of the WES Publications and Graphic Arts Division.

COL Allen F. Grum, USA, was the previous Director of WES. COL Dwayne G. Lee, CE, is the present Commander and Director. Dr. Robert W. Whalin is Technical Director.

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NOTE TO READER

This report is designated as Section 8.2.2 in Chapter 8 -- EQUIPMENT, Part 8.2 -- SITE AND SEEDBED PREPARATION EQUIPMENT, of the US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL. Each section of the manual is published as a separate Technical Report but is designed for use as a unit of the manual. For best retrieval, this report should be filed according to section number within Chapter 8.

ROOT PLOWS

Section 8.2.2, US ARMY CORPS OF ENGINEERS
WILDLIFE RESOURCES MANAGEMENT MANUAL

Root plows are used to control moderately to highly dense stands of root-sprouting woody species that are not easily controlled by other mechanical techniques or herbicides. Honey mesquite (*Prosopis glandulosa*), wolfberry (*Lycium berlandieri*), and several acacias (*Acacia* spp.) are examples of shrubs often controlled by root plowing. Control of over 90% has been reported in some studies (BLM 1969a, Larson 1980). Root plowing increases water infiltration by opening the soil surface and disrupting shallow, impermeable soil layers (Scifres 1980). This technique also stimulates forb production, thereby increasing seasonal wildlife foods. Root rakes, soil sifters, and broadcast seeders are often used in conjunction with root plows. Reseeding after treatment is usually mandatory because root plowing destroys most of the understory vegetation. The seedbed prepared by root plowing is rough and debris laden, making it resistant to wind and water erosion and suitable for broadcast seeding.

Root plowing has been most effective for land restoration in subhumid climates but has had limited success in semiarid regions (BLM 1969a, Scifres 1980). The major problem in semiarid regions is obtaining good establishment of forage by broadcast seeding after root plowing. Drill seeding will increase the success of forage establishment in semiarid climates, but root raking and soil sifting may be required to further prepare the seedbed. Root plowing, in conjunction with seeding, can increase forage production for both livestock and wildlife, but will reduce wildlife browse and cover components for up to 20 years after treatment (Scifres 1980). Therefore, small

root-plowed areas should be interspersed with untreated brush areas to maintain wildlife habitat diversity.

DESCRIPTION

A root plow is a single V-shaped blade pulled parallel to the soil surface. The blade is supported and attached to the dozer by a stout upright shank on each side of the blade which acts as a subsoiler or ripper (Fig. 1). Many root plows have cutting fins welded to the blade top to improve the ability of the plow to disturb the soil and expose roots (Larson 1980). Blades vary in size from 7 to 16 ft (BLM 1969a, Vallentine 1971, Holt Machinery Company 1974) and usually operate to a depth of 18 in. below the soil surface (Table 1). The depth of blade penetration is controlled by a cable or hydraulic lift system.

Table 1. General specifications for root plows

Feature	Specification
Overall width	9.5-17.3 ft
Cutting width	7.1-16.1 ft
Depth of penetration	
Maximum	36 in.
Normal	8-18 in.
Operating speed	1-4 mph
Power requirements	60-385 hp

OPERATION

The root plow blade is pulled below the soil surface by a 75- to 270-hp dozer (BLM 1969a, Larson 1980). The blade and fins shear roots from the plants and expose them to desiccation. The blade depth should be set to shear the root below the budding zone to prevent resprouting. From 1 to 4 acres can be treated per hour, depending on species, stem density, soil conditions, topography, and tractor size (Holt Machinery Company 1974).

Root plowing is most effective on dry soils and soils with a sandy texture (BLM 1969b, Larson 1980). Brush treatment is best accomplished immediately prior to the optimum seeding date. This allows roots to die from

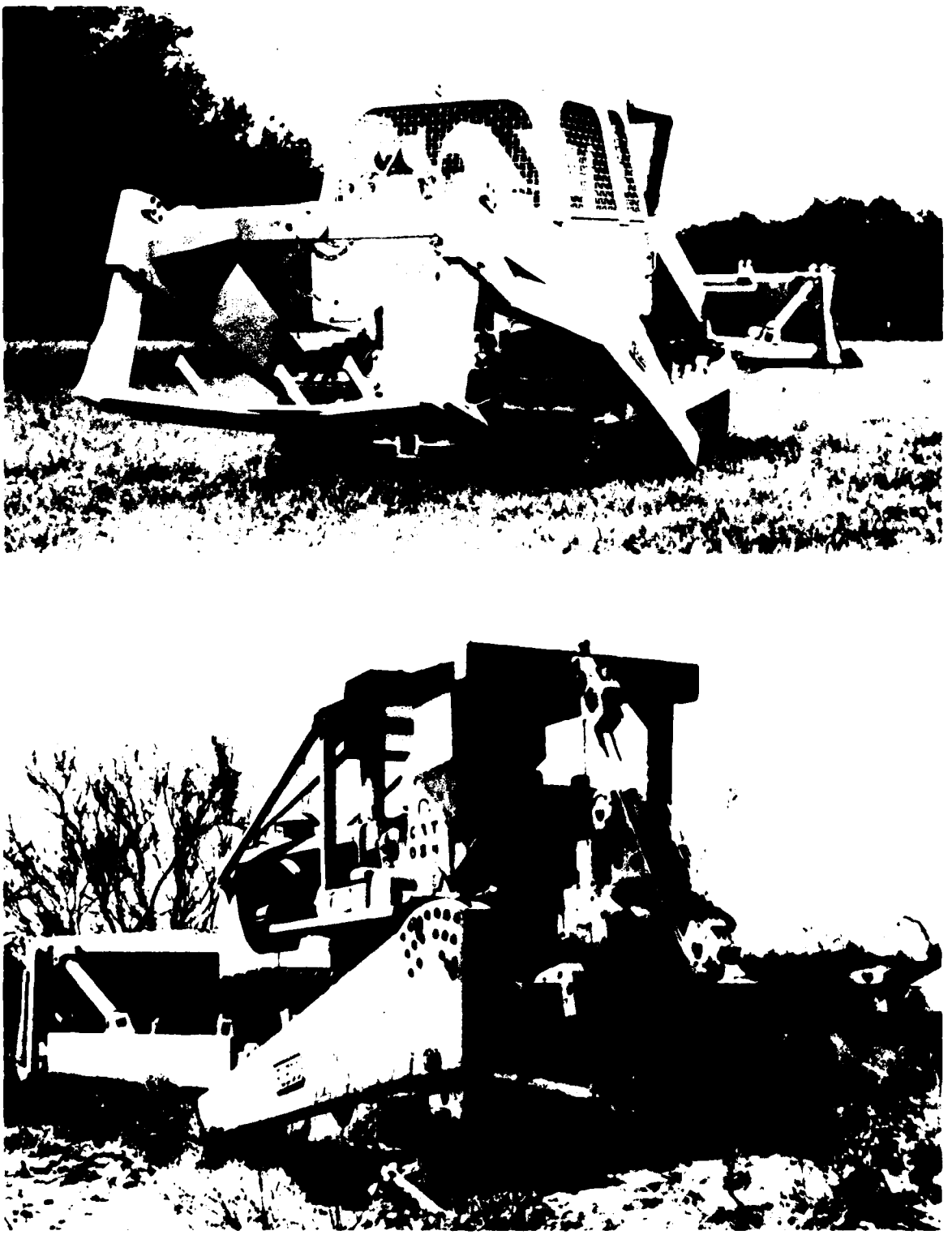

Figure 1. Rear view of root plow, showing three cutting fins welded to the blade (top), and rear view of root plow in operation (bottom). (Photos courtesy of H. T. Wiedemann, Texas Agricultural Experiment Station)

desiccation prior to seasonal rains that promote germination of broadcast seeds.

MAINTENANCE

Root plows require little maintenance due to their simple design. Blades should be sharpened and welds should be checked and repaired in a timely manner. The hydraulic and cable lift system should be maintained following manufacturer's specifications.

LIMITATIONS

Root plows cannot be used on shallow or extremely rocky soils. They are also ineffective on shallowly rooted rhizomatous plants, including most shrubby oaks (*Quercus* spp.) and prickly pear (*Opuntia* spp.) (BLM 1969a, Vallentine 1971, Scifres 1980). The blade is difficult to sharpen (Larson 1982), and root plows have high horsepower requirements (Larson 1980).

Reseeding after root plowing is required on most sites to improve forage quantity, thus increasing treatment costs. In semiarid regions drill seeding will be the optimum method of seeding. Areas to be drill seeded will require additional site preparation such as windrowing of debris and additional soil tilling. These factors and additional costs restrict the economic feasibility of root plows to brush-infested areas with deep fertile soils that have high potential productivity (BLM 1969b).

AVAILABILITY

Root plows are available from the following companies:

Fleco Corporation
P. O. Box 2370
Jacksonville, Florida 32203

Holt Machinery Company
P. O. Box 658
San Antonio, Texas 78293

Rockland Manufacturing Company
P. O. Box 5
Bedford, Pennsylvania 15522

Rome Industries
P. O. Box 48
Cedartown, Georgia 30125

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